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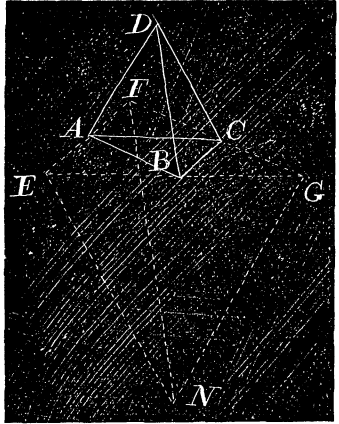
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SOLUTION BY NEWTON FITZ, NORFOLK, VIRGINIA.

Let $ABC-D$ represent the tetrahedron V , and let a be its altitude.

A plane through A parallel to the plane DBC will cut the plane of the base in EF parallel to BC . A plane through B parallel to DAC will cut the plane of the base in EG parallel to AC ; and a plane through C parallel to DAB will cut the plane of the base in FG parallel to AB . The intersections of these three planes will be the lines EN , FN , GN , parallel respectively to DC , DB and DA .

The tetrahedron $EFG-N$ will be similar to V and to V' . Because $AC = EB = BG$ the altitude of $EFG-N = 2a$. The altitude of the frustum remaining to V' after $EFG-N$ is removed is equal to the altitude of V , $= a$. Hence the altitude of $V' = 3a$ and $V' = 27V$. Q. E. D.



[Prof. Hyde's solution of this problem and also his solution of 225 are by quaternions. It was our intention to insert one of these solutions but the space remaining will not permit; and for like reason a solution of Mr. Baker's question, on p. 143, by Mr. Eastwood, and of Mr. Heal's question, on the same page, by Mr. Adcock, are, at present, excluded.]

PROBLEMS.

231. BY PROF. ORSON PRATT, SEN. — What is the sum expressed in terms of m , of the values of all the determinants, from the second to the n th orders inclusive, which can be formed from the m -gonal series of numbers, represented by $1, a_2, a_3, a_4, \dots, a_n$, the arrangement of the constituents of the respective determinants being after the following form:

$$\begin{vmatrix} 1, & a_2 \\ a_3, & a_4 \end{vmatrix} + \begin{vmatrix} 1, & a_2, & a_3 \\ a_4, & a_5, & a_6 \\ a_7, & a_8, & a_9 \end{vmatrix} + \begin{vmatrix} 1, & a_2, & a_3, & a_4 \\ a_5, & a_6, & a_7, & a_8 \\ a_9, & a_{10}, & a_{11}, & a_{12} \\ a_{13}, & a_{14}, & a_{15}, & a_{16} \end{vmatrix} + \&c.?$$

232. BY PROF. J. H. KERSHNER.—From two given points on a circle to draw straight lines through a point C in the circumference so they shall form with a line MN , given in position, a triangle CMN of given area.

233. *Selected, by Prof. M. L. Comstock.*—If $ABCD$ be a spherical quadrilateral whose sides AB, DC are produced to meet at P , and AD, BC , to meet at Q , and whose diagonals AC, BD intersect at R , then

$$\sin AB \sin CD \cos P - \sin AD \sin BC \cos Q = \pm \sin AC \sin BD \cos R.$$

234. *By P. Richardson.* — $ABCD$ is a trapezium, $AB = a$, $CD = b$, $AD = c$; angle ABC is a right angle, and E is a point on AD such that angle BCE is a right angle and $CE = CD = b$.

It is required to find BC, DE and AE .

235. *By W. E. Heal.*—Find the condition that the general equation of the n th degree may have q equal roots.

236. *By Christine Ladd, Baltimore Md.*—If A_1A_2, B_1B_2, C_1C_2 are three lines which meet in a point O , then there are four different ways in which the points $A_1, B_1, C_1, A_2, B_2, C_2$, can be combined into two homologous triangles, and for each combination there is a different axis of homology. Show that these four axes form a complete quadrilateral whose diagonals intersect each other on the lines A_1A_2, B_1B_2, C_1C_2 .

237. *By Prof. D. J. Mc Adam.*—Prove that

$$\int_0^\pi \frac{\cos \frac{1}{2}(n-1)(\theta+\pi) \sin \frac{1}{2}[n(\theta+\pi)]}{\sin \frac{1}{2}(\theta+\pi)} d\theta = \pi.$$

238. *By Artemas Martin, M. A.* — Two points are taken at random in the surface of a circle, radius r , one of them being confined to a given radius, and a chord drawn through the points. Find (1) the chance that the length of the chord does not exceed $2a$, and (2) the chance that it does not exceed the radius of the circle.

239. *By Prof. A. B. Evans.*—A can plant thirty-six per cent of his arrows within a circular target ten inches in diameter at the distance of one hundred yards; B can plant sixty-four per cent of his arrows within a circle thirteen and one third inches in diameter at the same distance.

Prove that B's skill is greater than A's.

240. *By Prof. Johnson.* — If the angles θ, φ and ϕ are connected by a certain relation any two of them may be the oblique angles of a spherical right triangle, and the third will be the complement of the perpendicular from the right-angle to the hypotenuse. Give a geometrical construction of the three triangles thus connected, and find the relations that exist between their sides.